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Steps Towards Carbon Neutrality

An Overview of Strategies and the Role of Offsetting

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Wuppertal Institut

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Contents

Foreword

The Wuppertal Institute has compiled a concise and inspiring overview of countries and stakeholders, their neutrality targets and concrete strategies. One important feature is the combination of credible domestic action with compensation/offsets for the remaining emissions. The overview also highlights the broad range of possible timelines for neutrality ambition.

The many different instruments and the target years involved inspire and facilitate debate and dialogue on the usefulness and optimum design of neutrality targets relative to climate leadership and raising ambition. Acknowledging the necessity for collectively and individually raised ambition, this is especially important in the lead up to the facilitative dialogue in 2018.

Germany has an ambitious climate strategy but no national neutrality target as such; there are, however, some areas that have adopted offsetting or overall neutrality targets. Federal Government travel is offset with high-quality CDM credits and one of the goals of Germany's National Sustainability Strategy is to make Federal Government activities carbon-neutral by 2030.

All COP23 emissions, including those from aviation, will be offset.

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Summary

In the Paris Agreement, the governments of the world have agreed to achieve climate neutrality in the second half of this century. More precisely, in Art. 4.1 Parties agreed to "achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases".

While the collective as well as the majority of efforts by individual countries fall short of embarking on a pathway toward that end, an increasing number of actors – countries, subnational entities, as well as corporations – have stepped up their efforts and set themselves carbon neutrality goals.

This Policy Brief portrays the commitments of Costa Rica, Norway, Sweden, as well as the City of Melbourne in Australia and Microsoft. All cases have set themselves ambitious neutrality goals and have implemented measures to achieve them. However, none of the cases will be able to achieve climate neutrality on their own, at least not in the short run. Remaining emissions will be compensated using carbon credits either from domestic offset schemes (Costa Rica) or from international schemes.

For the time being, voluntary carbon neutrality goals, as presented in this Policy Brief, are an effective way to demonstrate leadership. For the foreseeable future, pioneering actors that assume voluntary carbon or climate neutrality goals could provide a significant source of demand for international carbon credits.

1 Introduction

With the adoption of the Paris Agreement, the world has agreed on a global climate neutrality goal. The global temperature goal – "[h]olding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels" (UNFCCC, 2016b, Art. 2.1a) – is further operationalized in Article 4. The latter effectively defines carbon neutrality:

> *"In order to achieve the long-term temperature goal set out in Article 2, Parties aim to reach global peaking of greenhouse gas emissions as soon as possible, recognizing that peaking will take longer for developing country Parties, and to undertake rapid reductions thereafter in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century, on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty "* (UNFCCC, 2016b, Art. 4.1)

While the time horizon of the set goal is not particularly clear in the Paris Agreement, various analyses have been conducted to this end. The UNEP Emissions Gap Report summarizes these analyses and concludes that in order to attain the 2 °C limit (with a 66% chance) it would be necessary to phase out CO_2 emissions from energy and industry by ~2070 and total GHG emissions by 2085. For the more ambitious 1.5 °C goal (50% chance of attainment) CO_2 emissions from energy and industry would have to be phased out some time between 2045-2055 and total GHG emissions need to cease to be emitted by 2060-2080 (UNEP, 2016).

What is more, the last sub-clause of Art. 4.1 implies that industrialized countries must take the lead. According to the principle of common but differentiated responsibilities and respective capabilities enshrined in the original Framework Convention, it is their responsibility to achieve a net balance of GHG emissions and removals by sinks earlier than their developing country counterparts and hence earlier than the global aggregate. Unfortunately, the Paris Agreement lacks any formal operationalization of equity. In no way does the agreement go beyond the aggregate level and provide an indication which country or sector is expected to achieve climate neutrality at what point in time.

Nevertheless, several countries have indicated voluntary that they intend to achieve climate or carbon neutrality[1]:

- Costa Rica originally pledged to become carbon neutral by 2021. However, in its INDC, it has revised its initially more ambitious goal and now plans to achieve zero net emissions (climate neutrality) by 2085 (Government of Costa Rica & MINAE, 2015; MINEAT, 2009);
- Norway has proposed to become carbon neutral by 2030 (Norwegian Ministry of the Environment, 2012);
- Sweden and Finland intend to achieve carbon neutrality by 2045 (Climate Home, 2017; Ministry of the Environment of Finland, 2017).

A couple of other countries had communicated similar plans, but did not follow up ever since. This includes, for example, New Zealand (Helen Clark, 2007). Also, Ethiopia has announced to become carbon neutral as it transitions to a middle income country. The country has put forward a very ambitious INDC and aims to be

[1] for a differentiation of the two concepts see box on page 2

come a middle income country by 2025, yet it has not specified whether and how remaining emissions will be offset. Instead Ethiopia has expressed its intention to supply carbon credits (Federal Democratic Republic of Ethiopia, 2015).

Alongside these countries, non-state and subnational actors increasingly step up their climate action. A growing number of cities and corporations has committed to carbon or climate neutrality. In section 3 we present two examples in more detail: the City of Melbourne and Microsoft.

It is the goal of this Policy Brief to provide an overview of the increasing number of voluntary carbon/climate goals. In section 2, the three most advanced national neutrality goals will be explored: Costa Rica, Norway, and Sweden. The assessment elaborates on the following questions:

- What has been committed and by when?
- What is the legal/political status of these commitments?
- What are the challenges faced by the countries in implementing the goal and by which means/policies are these challenges addressed?
- What role do they foresee for international/domestic offsetting?

Section 3 then provides a scant overview of neutrality commitments made by non-state and subnational actors. This overview will be complemented and illustrated by two exemplary cases mentioned above.

Section 4 discusses the findings by inter alia reflecting the role of voluntary neutrality pledges in the light of the aggregate objectives of the Paris Agreement and highlighting potential implications for international carbon trading.

Carbon vs. Climate Neutrality

Carbon neutrality is referred to as the net balance between anthropogenic carbon dioxide (CO_2) emissions and removals by carbon sinks. Sinks can be either natural – CO_2 stored in biomass, soils or oceans – or artificial when CO_2 is stored in the built environment (think of wooden buildings) or stored in geological formations by industrial processes (CCS).

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thirds of global greenhouse gas emissions. Other GHGs are methane (CH_4), nitrous oxide (N_2O),
ıs
(PFCs), and sulphur hexafluoride (SF_6). Under the Kyoto Protocol, all these gases were considered in the so-called basket approach. The global
ıs
been used as a point of reference to calculate conversion factors for all other GHGs. In so doing, it was possible to come up with a common metric for all GHGs expressed in CO_2 equivalents (CO_2e).

Climate or GHG neutrality is thus the more encompassing goal since it covers all gases and implies a net balance of CO_2e (UNEMG, UNEP, GRID-Arendal 2008: 14).

While for entire nation states, climate neutrality should be the ultimate goal and in fact is what countries have committed to collectively in the Paris Agreement, for non-state and subnational actors it may be more appropriate and practical, especially when they hardly contribute to emissions of other gases.

2 Country-Wide Strategies

2.1 Costa Rica: Carbon Neutrality by 2021

2.1.1 Status of the Goal

In the year 2007, then President Oscar Arias declared that Costa Rica would become the world's first carbon-neutral country by the year of its 200th anniversary of independence. Since then, a long list of plans and strategies has been brought forward.

A first step towards the carbon neutral goal was the adoption of National Climate Change Strategy – NCCS (Estrategia Nacional de Cambio Climático – ENCC) by Costa Rica's Environmental Ministry in 2009. This document set the timeline for becoming a Climate Neutral economy by the year 2021 through a sustainable development strategy with an associated low carbon emission pathway. In the strategy, the goal is defined as climate neutrality, i.e. a balance between anthropogenic GHG emissions and the removal of CO_2 sequestered in the countries tropical forests (MINEAT, 2009).

The mitigation strategy is structured around three main action areas. The first, reduction of GHG emissions by sources, aims to identify emission sources and develop opportunities for reductions in eight sectors. The second area of action addresses carbon sequestration in forests and reforestation. Complementing the scheme on mitigation, the third area refers to emission compensation via international carbon markets and encompasses the development of local markets, national programs for compensation payments, voluntary markets and participation in international schemes, such as the Clean Development Mechanism (CDM). (Nachmany et al., 2015).

All things considered, the Costa Rican neutrality goal is strongly institutionalized and implementation is well under way.

2.1.2 The Challenge Ahead

On 13 October 2016, Costa Rica ratified the Paris Agreement. However, in its Nationally Determined Contribution (NDC) the references to its carbon neutrality goal is somewhat ambiguous. On the one hand, Costa Rica "reaffirm[s] its aspiration of becoming a Carbon Neutral economy starting year 2021" (Government of Costa Rica & MINAE, 2015, p. 2). The formal INDC target communicated, on the other hand, does not align with this aspiration. For 2030 Costa Rica has committed to keep emissions below 9.37 $MtCO_2e$. Net neutrality of emissions is now targeted for in 2085 only (Government of Costa Rica & MINAE, 2015).

According to government officials, the backtracking from the more ambitious earlier goal in part is a result of better insights into the countries' GHG inventories. New forest accounting practices revealed that Costa Rica's mature forests are sequestering much less CO_2 per annum than initially assumed (Replogle, 2015).

For Costa Rica, the biggest remaining challenge concerns emissions from transportation. Costa Rica's CO_2 emissions from fuel combustion almost exclusively originate from oil and petroleum products, the bulk of which (71%) is petrol and diesel in the transport sector (IEA, 2016a). A key mitigation strategy pursued therefore is to incentivize fuel switch for final use in the transport sector, mainly towards electric transportation.

The power sector, though, already is almost emission free since only less than 10% of the

electricity is generated by fossil fuelled plants (66% hydro, 15% geothermal, 7.2% solar & wind power) (IEA, 2016b). Still, Costa Rica prioritizes energy efficiency to reduce demand and has set itself an aspirational goal to reach 100% renewable energy in 2030 (Government of Costa Rica & MINAE, 2015; Government of Costa Rica, MINAE, DSE, & UNDP, 2015). Some 13.7% of the country's emissions (including emissions from coal consumption) stem from manufacturing industries and construction. Costa Rica is also a country with rich tropical forests. Enhancing carbon sequestration in forests and reforestation are therefore also key priorities in the country's mitigation strategy. The LUCF (land use change and forestry) sector currently removes from the atmosphere an estimated 11.32 $MtCO_2$ per year (WRI, 2013).

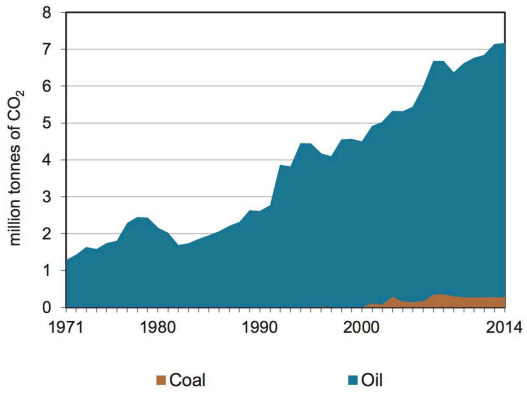

Figure 1: Costa Rican CO_2 emissions from fuel combustion by fuel. *Source: IEA (2016a).*

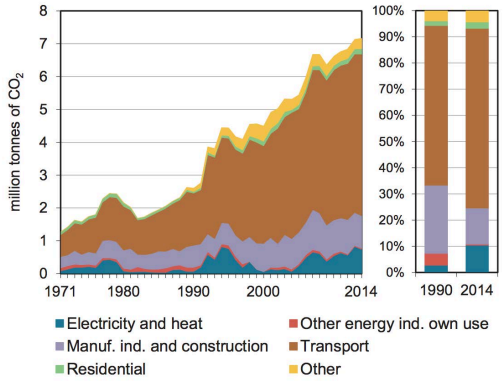

Figure 2: Costa Rican CO_2 emissions from fuel combustion by sector. *Source: IEA (2016a).*

Costa Rica also relies on voluntary contributions from its private sector. A key component of the national strategy in this regard is promoting a "C-Neutral-label" to certify that tourism and certain industries mitigate all of the carbon dioxide they emit. Under the certification system, tourists and businesses will be charged a voluntary fee to offset their carbon emissions. The money is used to fund conservation, reforestation, and research in protected areas (MINEAT, 2009).

2.1.3 The Role of Offsetting

Costa Rica has decided to complement its domestic mitigation strategy with a scheme for emission compensation (carbon markets) that focuses on the development of local markets, national programs for compensation payments, voluntary markets and participation in international schemes, such as the CDM. Costa Rica's Voluntary Domestic Carbon Market was established in 2013. Its key features are presented in the following:

- companies looking to become carbon neutral or offset their emissions purchase carbon credits through $BanCO_2$ for unavoidable emissions.
- $BanCO_2$ is a 2013 established national environmental bank, which serves as a market platform for trade of UCCs (Costa Rica's carbon credits). These tradable units allow individual people and companies to offset their GHG emissions.
- The National Forestry Financing Fund (FONAFIFO) approves the carbon certificates. The fund receives a payment through the transaction between a buyer of credits and $BanCO_2$. The revenues are used to secure the future of the fund's Payments for Ecosystem Services (PES) program.

Since Costa Rica is using its own proprietary crediting scheme, it is not possible without substantial research to assess the quality of the issued certificates. Such an analysis is beyond the scope of this Policy Brief.

2.2 Norway: Carbon Neutrality by 2030

2.2.1 Status of the Goal

Originally, Norway had proposed to become carbon neutral in 2050. This initial target was based on a political consensus achieved in 2012. In the corresponding White Paper on the Norwegian Climate Policy, the Norwegian government outlined that Norway would unilaterally commit to carbon neutrality by 2030. The white paper also states that

> *As part of an ambitious global climate agreement where other developed nations also take on ambitious commitments, Norway will adopt a binding goal of carbon neutrality no later than in 2030. This means that Norway will commit to achieving emission reductions abroad equivalent to Norwegian emissions in 2030. (Norwegian Ministry of the Environment, 2012)*

This target was reiterated in the country's NDC in the context of the Paris Agreement. More specifically, Norway has unconditionally committed to reduce GHG emissions to 40% below the levels of 1990 in 2030 (Government of Norway, 2015).

As regards the conditional commitment, the same language has been used as in the 2012 white paper quoted above. Whether or not the Paris Agreement and the NDCs by other developed countries meet the conditions outlined in Norway's NDC is still under discussion. Norway's most recent climate act merely enshrines the commitments of the NDC into national law and prescribes an annual review process. The act does not contain any reference to the neutrality goal (Norway, 2017).

2.2.2 The Challenge Ahead

Despite its advantageous situation in terms of rich renewable energy potentials, in 2012 Norway still featured CO_2 emissions above the average of the EU. The biggest sources of CO_2 emissions from fuel combustion in terms of sectors are transport with 14.04 $MtCO_2$ (10.6 $MtCO_2$ of which amount to road transport) and the country's oil and gas industry. Some 10.93 $MtCO_2$ are emitted in oil refineries and at sites of oil and natural gas extraction (IEA, 2016a).

Like Costa Rica, Norway has hardly any CO_2 emissions in the power sector since electricity generation is dominated by hydro power. In 2015, only about 2.3% of electricity was generated from combustible fuels (IEA, 2016b).

Norway's forests are a significant carbon sink and currently sequester an estimated 26.7 $MtCO_2$ per annum (Norwegian Ministry of Climate and Environment, 2015).

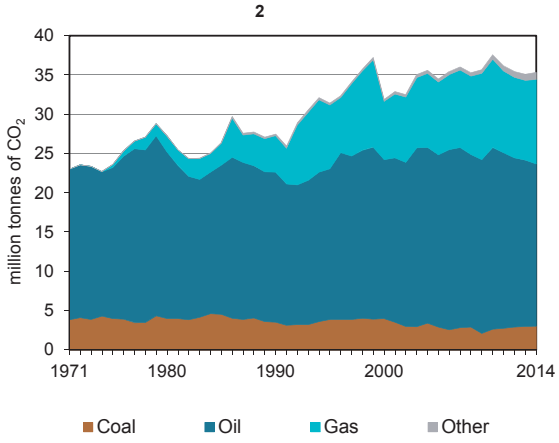

Figure 3: Norway's CO_2 emissions from fuel combustion by fuel. *Source: IEA (2016a).*

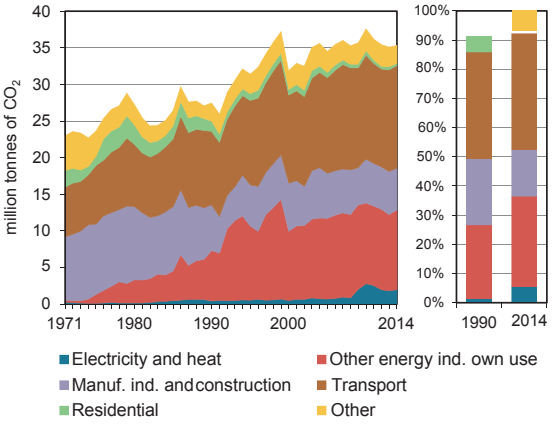

Figure 4: Norway's CO_2 emissions from fuel combustion by sector. *Source: IEA (2016a).*

Key policies to address emissions for Norway are pricing instruments: a carbon tax and the participation in the EU Emissions Trading Scheme (EU ETS). The EU ETS covers emissions from land-bound manufacturing industries such as cement, steel, and pulp and paper, but also the biggest chunk of Norwegian industrial emissions, namely emissions from the offshore oil and gas extraction industry (Norwegian Ministry of Climate and Environment, 2015).

Not covered are, however, transport emissions. To this end, Norway has prioritized railway infrastructure over road infrastructure. The country has also introduced aggressive policies for the promotion of electric vehicles and has consequently become a leading market for electromobility (Norwegian Ministry of Climate and Environment, 2015).

Apart from that, Norway has been a leading country in the development of technologies for carbon capture and storage (CCS) technologies and has expressed its intention to continue on that road (Norwegian Ministry of Climate and Environment, 2015).

With respect to transport emissions, Norway has advanced substantially. Strong fiscal incentives and a campaign to set up the required infrastructure has lead to a surge in sales of electric vehicles in the country (Figenbaum, 2016). But the second largest share of remaining emissions will be much more difficult to address: emissions from fossil fuel extraction. Ironically, Norway does not even use much of the oil and gas extracted on its own but exports most of it. Norway has opted to address these emissions through the EU ETS and oil and gas companies are not entitled for any free allocations but need to purchase all their allowances. However, current price levels in the EU ETS are rather low, too low probably to effectively drive down emissions from oil and gas extraction. Moreover, not being a member of the EU, Norway has very limited leverage to change this. It may therefore well be the case that, at least with the current instruments, Norway will not be able to achieve its neutrality goal domestically, but would have to revert to international offsets.

2.2.3 The Role of Offsetting

Norway has long been a strong supporter of market-based instruments. This is also true for the CDM as well as the mechanisms to emerge from the Paris Agreement's Article 6. In its latest submission on the matter Norway has, for example, stated that "a UN mechanism with rules agreed between all Parties highly valuable. This would limit unnecessary proliferation of concepts and units in the market" (Norwegian Ministry of Climate and Environment, 2016).

While the Norwegian governments position was relatively clear and stable over the last years, there seems to be a political controversy with respect to the scale and scope to which offsetting is used to fulfil Norway's carbon neutrality goal, this being one reason why new legislation has not been adopted as of yet.

2.3 Sweden: Carbon Neutrality by 2045

In February 2017, the Swedish government announced its commitment to become climate neutral in 2045 (with gross emissions of at least 85% below 1990 levels). The respective policy framework consists of the aforementioned goal, Sweden's first overarching climate act that enshrines this goal, as well as a climate policy council that is supposed to assist the government, inter alia by providing evaluation of climate policies and their implementation in relation to the set goals. In June 2017, Swedish legislators overwhelmingly approved the proposal and turned it into law (Climate Home, 2017). The climate act take effect as of January 2018 (Government of Sweden, 2017).

The Swedish commitment is based on the recommendations of a cross-party committee on environmental objectives, established already in 2014 and tasked to develop a broad consensus on environmental policy objectives and to consult the Swedish government on the matter (miljomal.se, 2016).

2.3.1 The Challenge Ahead

As in the cases of Costa Rica and Norway, the largest share of remaining emissions originates from the transport sector. In 2014, the sector accounted for more than half of all emissions from fuel combustion and still more than a third if all GHGs are considered (excl. emissions/removals from agriculture, forestry and other land use). The next leading emission intensive sectors are manufacturing industries and construction (17.4% of CO_2 emissions from fuel combustion) and electricity and heat (16.8% of CO_2 emissions from fuel combustion) (IEA, 2016a).

Emissions in the power sector are relatively low due to the large share of hydropower (46% in 2015) and nuclear power (35% in 2015). Since 2010, the share of wind power has also increased significantly and surpassed 10% of electricity generated in 2015 (IEA, 2016b).

On its way to achieving the climate neutrality goal, Sweden has set sectoral milestones along the way: a fossil free vehicle fleet by 2030 and a 100% renewable energy target for the power sector by 2040.

For the former, Sweden pursues a dual strategy. On the one hand, it intends to substantially increase the use of biofuels in the sector. This strategy is complemented by a strategy to increase the share of electric vehicles in the sector (Government of Sweden, 2016; Johansson, 2015).

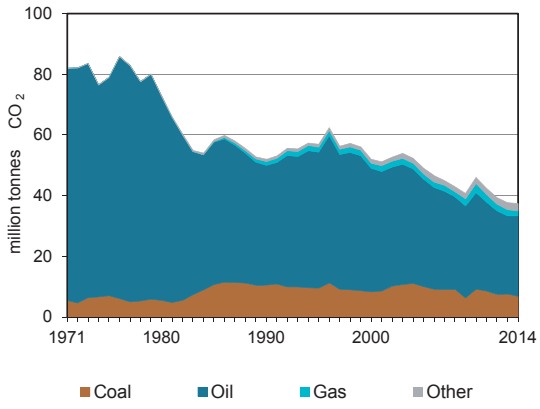

Figure 5: Swedish CO_2 emissions from fuel combustion by fuel. *Source: IEA (2016a).*

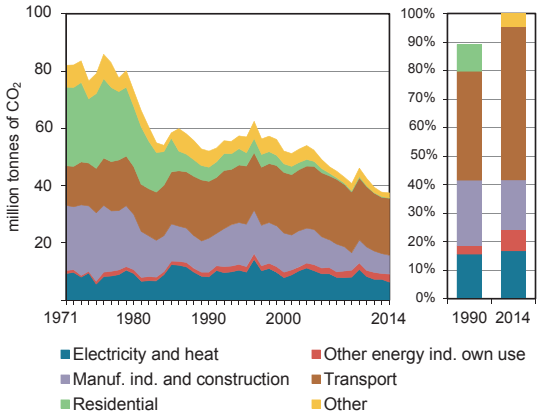

Figure 6: Swedish CO_2 emissions from fuel combustion by sector. *Source: IEA (2016a).*

The latter target was adopted by a broad consensus among all major Swedish parties in the Riksdag. The target is ambitious in that currently 35% of electricity is produced by nuclear power and at least four out of ten Swedish nuclear reactors are scheduled to be decommissioned no later than 2020. Still, the Energy Policy Commission that prepared the consensus stated that the 2040 target is „not a deadline for banning nuclear power, nor does it mean closing nuclear power plants through political decisions" (Energy Policy Commission, 2017, p. 22).

2.3.2 The Role of Offsetting

Like Norway, Sweden has been a strong proponent of international carbon markets under the UNFCCC and has strongly utilized the CDM. Consequently, Sweden has also proposed to revert to international offsets to attain its climate neutrality goal. In a fact sheet issued by the Swedish government on the 2045 neutrality goal it is stated that to "achieve zero net emissions, supplementary measures may be counted. This can, for example, be increased uptake of carbon dioxide in forests and land, and *investments in other countries*." (Government of Sweden, 2017, p. 2 emphasis added).

3 Non-State Actor Initiatives for Carbon Neutrality

Recent years have seen a strong uptake of climate change mitigation initiatives that transcend the governance level of nation states. Sub-national entities such as municipalities, civil society organisations (CSO) and businesses have begun to lead the way on climate action, some of them far more ambitious than their respective national governments. As of July 2017, the UNFCCC Secretariat's NAZCA platform lists a total of 2508 cities, 209 regions, 2138 companies, and 238 CSOs that taken commitments on climate action (UNFCCC, 2017). Few of them are ambitious enough to commit to carbon or even climate neutrality, but some are.

The subsequent section provides an overview of such non-state actor initiatives and presents more detailed examples of such commitments: the City of Melbourne and Microsoft.

3.1 Carbon Neutral Initiatives: An Overview

Urban areas account for nearly three-quarters of anthropogenic emissions. Due to population growth and increasing urbanization, urban infrastructures will have to double by 2050. If current unsustainable technologies and practices are continued, this alone will consume about half of the remaining carbon budget (IPCC, 2014). Consequently, in reimagining and reinventing cities in ways that promote economic

City	Target	Population	Annual Emissions	Offsetting
Berlin	Climate Neutral by 2050	3 439 837 (2014)	21.3 million tCO_2, 6.2 tCO_2 per capita	-
Adelaide	Carbon Neutral by 2020	1 326 354 (2016)	0.94 million tCO_2e, 0.7 tCO_2e per capita	yes
Melbourne (inner city)	Climate Neutral by 2020	138 000 (2016)	4.15 million tCO_2e, 30.1 tCO_2e per capita	yes
Copenhagen	Carbon Neutral by 2025, Climate Neutral by 2050	591 481 (2016)	1.45 million tCO_2e, 2.4 tCO_2e per capita	-
Freiburg	Climate Neutral by 2050	226 393 (2015)	1.73 million CO_2, 8.0 tCO_2 per capita	-
Ghent	Climate Neutral by 2050	257 029 (2016)	1.44 million tCO_2, 5.6 tCO_2 per capita	-
Reykjavik	Carbon Neutral by 2040	121 230 (2014)	0.33 million tCO_2, 2.8 tCO_2 per capita	yes
Rio de Janeiro	Carbon Neutral by 2065	6 476 631 (2015)	20.3 million tCO_2e, 3.1 tCO_2e per capita	?
Seattle	Climate Neutral by 2050	662 400 (2014)	4.1 million tCO_2e, 7.0 tCO_2e per capita	yes

Table 1: Overview of cities that have committed to neutrality goals.

prosperity, social equity, enhanced quality of life, and climate resilience, cities have an extraordinary responsibility and capacity to contribute to climate change mitigation.

A large number of cities have taken up this responsibility and developed their own GHG reduction targets. Many focus on energy and have committed to organize their energy supply 100% based on renewable energy. A small number of cities even strive to altogether phase-out carbon emissions. Table 1 above provides a non-exhaustive list of cities that have made such commitments.

Likewise, many companies have taken up similar commitments. Table 2 below provides some illustrative examples of such commitments

3.2 The City of Melbourne: Carbon Neutrality by 2020

Probably the most aggressive neutrality target by a city is the one put forward by the City of Melbourne. The goal is not only ambitious because Australia features the highest per-capita-emissions in the developed world, but also because of the short time frame for reaching the goal: the target year is 2020. Moreover, the City of Melbourne has also advanced considerably in implementing the goal and has put into place respective legislation since adopting the goal.

As early as 2003, the City of Melbourne has presented its first "Zero Net Emissions by 2020 Strategy" (ZNE Strategy); it has updated this strategy in 2008 and 2014. It lays out sector-specific intermediate goals in order to break down the challenge (City of Melbourne, 2014). These include:

- **Council operations:** reduce GHG emissions by 10% by 2018 based on baseline year 2010-2011 and offset remaining emissions to achieve carbon neutrality.
- **Commercial buildings and industry:** Increase the energy efficiency of 40% per building by 2018.
- **Residential buildings:** Establish a baseline and develop a long-term target in the first year of the implementation plan.
- **Stationary energy supply:** 25% of electricity from renewable sources by 2018.
- **Transport and freight:** Increase the percentage of all trips to and from the municipality of Melbourne using sustainable transport from 51% in 2009 to 60% by 2018.
- **Waste management:** Decrease waste to landfill per resident by 5% by 2018.

Company	Sector	Target/Ambition	Employees	Annual Emissions	Offsetting
Aviva	financial services	Carbon-Neutral since 2006. Aims for Climate-Neutrality.	27,718	165,115 tCO_2e	Yes
Deutsche Post DHL	logistics	Climate Neutral in transportations by 2050	508,036	26.92 $MtCO_2e$	?
Google Inc.	software / internet technology	Carbon-Neutral across the value chain since 2007	72,053	2.49 $MtCO_2e$	Yes
Marks & Spencer	retail (fashion)	Carbon-Neutral by 2020	85,813	526,000 tCO_2e	Yes
Microsoft	software / internet technology	Carbon-Neutral since June 2012.	114,000	431,251 tCO_2e	Yes
Philips	electronics	Carbon-Neutral by 2020	112,959	1.417 $MtCO_2$	Yes
Sony	electronics	Climate Neutral by 2050	125,300	1.37 $MtCO_2e$	Yes

Table 2: A selection of companies with neutrality commitments.

3.2.1 The Challenge Ahead

The City of Melbourne is situated in the heart of Metropolitan Melbourne, the state capital of Victoria and serves as the local government authority responsible for the Melbourne city centre and fourteen surrounding inner-city suburbs. The residential population amounts to some 140,000 inhabitants. Yet, on an average weekday nearly 1,000,000 people commute into the city.

Between 2010 and 2020 emissions are projected to grow by 5.1% annually under business-as-usual. Studies commissioned by the municipality identified GHG emission reduction potential of approximately 2.2 $MtCO_2e$. This figure does not include emission reductions related to an increase of renewable energy in power supply. Taking into account the goal of providing 25% of electricity supply from renewable energies, the city can cut projected BAU emissions roughly in half.

In the fifteen years since the launch of the ZNE road map, Melbourne has built the foundations to reduce the carbon footprint significantly. Moreover, it has implemented a series of programs collaborating with both residents and local businesses in order to leverage the identified mitigation potentials.

3.2.2 Role of Offsetting

Since significant emissions will remain despite all efforts, the City of Melbourne will rely on offsetting to compensate the remaining emissions.

Offsetting is already being used to compensate emissions of the operations of the city council. In April 2012, Melbourne endorsed the Carbon Neutral Strategy for Council Operations. In 2013, the City of Melbourne for the first time achieved carbon neutral certification for the 2011-2012 financial year of its council operations. In order to offset the remaining GHG emissions – not only of the city council but of the entire city in 2020 –, cost estimates are in the order of 30 million Australian Dollars based on a unit price of 10$ per tonne CO_2e.

For the offsets, the City of Melbourne relies on the Australian National Carbon Offset Standard (NCOS). This standard sets minimum requirements for calculating, reducing, offsetting, auditing and reporting on emissions. Moreover, it aims to ensure the quality of offsets by limiting the eligibility of units. Eligibility is limited to Australia's domestic crediting unit (Australian Carbon Credit Units – ACCUs), CERs from the Clean Development Mechanism, Removal Units (RMUs) issued on the basis of land use, land-use change and forestry activities under article 3.3 or 3.4 of the Kyoto Protocol, and voluntary emission reduction units issued by the Gold Standard or the Verified Carbon Standard. It also requires participating entities to publish public disclosure statements on its emissions and the offsets used. (Commonwealth of Australia, 2015).

3.3 Microsoft

In March 2009, then CEO Steve Ballmer announced that by 2012, Microsoft would reduce its carbon emissions by at least 30% per unit of revenue from their 2007 levels by optimizing the use of technology, reducing energy consumption and air travel, as well as increasing investments in RE and offsetting.

After the company reached this goal within three years, Microsoft set a more ambitious target in June 2012. The new commitment was to become carbon neutral. Microsoft achieved this virtually immediately by purchasing Renewable Energy Certificates (RECs) for the power consumed and offsetting the remaining emissions (inter alia from air travel). Since July 2012, Microsoft has been operating 100% carbon neutral for all their operations, including their datacentres, offices, software development labs,

manufacturing plants and business air travel since (Microsoft, 2016).[2]

Microsoft seeks to reduce its emissions with strategy based on three pillars (Microsoft, 2012):

1. Increasing energy efficiency in its facilities and reducing air travel. This is supported and monitored via key indicators such as power usage effectiveness (PUE), carbon usage effectiveness (CUE) and water usage effectiveness (WUE) for data centres, energy efficiency for software development labs, emissions per housed employee per square foot for offices, and air travel miles per employee.
2. Increasing purchases of renewable energy and reducing waste and water use. Microsoft invests not only in renewable energy certificates (RECs) and carbon offsets, but also seeks to sign long-term RE power purchase agreements, invests directly in RE projects and connects its own energy-hungry data centres to on-site RE generation and innovative methane fuel cells.
3. Increasing the accountability within the organization by rigorously tracking emissions and introducing an internal carbon fee on all emissions within the responsibility of Microsoft's own groups and business units. The collected revenue is fed into a central fund and used to purchase renewable energy and support sustainable energy innovation, carbon offsets, and to invest into internal emission reduction measures. The breakdown of investments is presented in figure 7.

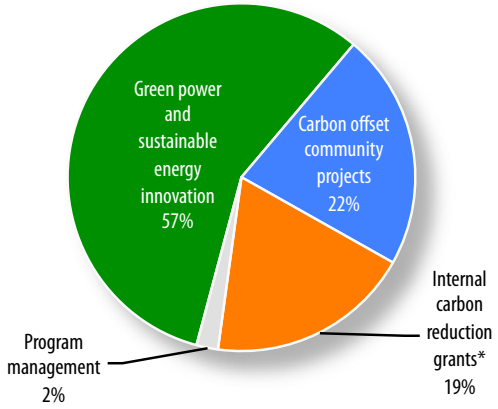

Figure 7: Microsoft's carbon fee fund investments in the fiscal year 2015. *also includes e-waste recycling. *Source: Microsoft (2015).*

Role of Offsetting

Together with the carbon fee, carbon offset projects play an important role in Microsoft's carbon neutrality policy. The company purchases carbon credits that compensate for the emissions associated with their business air travel and any energy consumption in regions where they cannot procure RE. Microsoft's carbon offset portfolio includes 47 projects, in 26 countries, saving over 2 million tCO_2e. Microsoft claims to prioritize projects that are aligned with the Sustainable Development Goals and promote community level sustainable development (Microsoft, 2016). Microsoft has further limited itself to sourcing offset credits from projects certified under one of five established crediting schemes: the Verified Carbon Standard, the Gold Standard, the Climate Action Reserve, the American Carbon Registry , or the Clean Development Mechanism (Microsoft, 2015)

[2] Note that there is no third-party assessment of the claims made by Microsoft. However, Microsoft reports its emission data through the Carbon Disclosure Project (CDP), a registered international not-for-profit organisation. Also for its GHG reporting, Micrsoft relies on the World Resources Institute's Greenhouse Gas Protocol (Microsoft, 2017)

Carbon Neutral Business Travels of the German Federal Government

Photo credit: Kobe airport by Naoya Fujii / Flickr.com / CC BY-NC 2.0

In 2015, the German Federal Government decided in to offset the climate impact of all business travel that employees of ministries and subordinate national authorities conduct by air or by car in the current legislative period (2014 – 2017). For air travel, this does not only include direct effects of CO_2 emissions but includes 'non-CO_2' effects (such as water vapour, nitrogen oxides and carbon black particle emissions) that occur at high altitudes. In total, cumulative emissions amounted to 576 908 tCO_2e for the 2014-2016 period.

To compensate these emissions, the Federal German Government uses certificates generated under the Clean Development Mechanism (CDM) and also applies its own quality assurance criteria to support projects of especially high quality which, apart from their actual mitigation effect, have other positive sustainability effects such as protecting other environmental media – air, soil and water – or have a developmental impact by means of rural electrification, strengthening the local jobs markets, providing further education and training for the local workforce, supporting local utility suppliers and assisting health protection.

To date, certificates have been used from five projects: one each on household biogas in China and Nepal, one on electricity generation from harvest waste in India, a wind power project in Costa Rica and an electricity generation from landfill gas activity in Mexico. When implementing this measure, the Federal German Government will be assisted by the German Emissions Trading Authority (DEHSt). The DEHSt calculates journey-related emissions, chooses the offsetting projects and is also responsible for buying and cancelling the emission certificates required.

4 Discussion and Conclusions

In order to have a chance to attain the objective of the Paris Agreement – to limit global warming to well below 2°C and make efforts to limit the temperature increase even to 1.5°C – the aggregate ambition of the first round of Nationally Determined Contributions is insufficient (UNFCCC, 2016a). In the accompanying COP decisions to the Paris Agreement, Parties explicitly took note of that mismatch between ambition and (proposed) action. The conference of the Parties *noted "with concern"*

> *"that the estimated aggregate greenhouse gas emission levels in 2025 and 2030 resulting from the intended nationally determined contributions [...] lead to a projected level of 55 gigatonnes in 2030, and also notes that much greater emission reduction efforts will be required than those associated with the intended nationally determined contributions in order to hold the increase in the global average temperature to below 2 ℃ above pre-industrial levels by reducing emissions to 40 gigatonnes [...]" (UNFCCC, 2016c, para. 17)*

While all of the national neutrality commitments presented above are long-term commitments and do not necessarily translate into ramping up short-term ambitions, they still represent some of the most ambitious mitigation commitments of all countries.

The two non-state neutrality commitments portrayed above are even more ambitious as they feature much shorter timelines to achieve the neutrality objective. In the absence of sufficiently strong national mitigation efforts, such initiatives can help lead the way and demonstrate the viability of very ambitious mitigation action. In its preamble the Paris Agreement explicitly recognizes the role of such initiatives, of actors of various governance levels beyond the national level. Moreover, in the decision adopting the Paris Agreement, Parties agreed to

> *"uphold and promote regional and international cooperation in order to mobilize stronger and more ambitious climate action by all Parties and non-Party stakeholders, including civil society, the private sector, financial institutions, cities and other subnational authorities, local communities and indigenous peoples." (UNFCCC, 2016c, p. 3)*

While all of the presented cases truly are ambitious commitments, the analysis shows that all rely to some extent on offsetting. Often, offsetting is portrayed as a fig leave or as a form of "greenwashing", but the brief review of the cases shows that this is not the case here. In fact, all three countries as well as the City of Melbourne and Microsoft first and foremost have taken measures to reduce their own emissions. At this stage, offsetting remains necessary, because not all emissions are practically abatable.

For the credibility of commitments it is key that not any offset units are used but such units that meet high standards of environmental integrity and ideally come with significant sustainable development benefits beyond the reduction of GHGs. While it is beyond the scope of this Policy Brief to assess the quality of the used credits in detail, all of the cases reviewed have specified their own criteria for offset credits and rely on independently verified credits.

In the long run, however, the reliance on offsets may cause problems, because eventually global economies and societies must find ways to phase out anthropogenic GHG emissions altogether. When the world approaches this point,

there will be simply no room for offsetting through certified emission reductions or avoided emissions. These kind of offsets do not actually reduce the carbon content of the atmosphere but "correct" an otherwise less climate friendly development. In order to achieve the 1.5°/2°C target, we need to get to a point in climate-compatible becomes the norm. Ultimately, only carbon sequestration projects that actively reduce the atmospheric GHG concentration can ensure true neutrality (cf. Butler et al., 2015).

However, for the time being, voluntary carbon neutrality goals are an effective way to demonstrate leadership. For the foreseeable future, pioneering actors that assume voluntary carbon or climate neutrality goals could provide a significant source of demand for international carbon credits. If these credits are issued by mechanisms that align with the principles set out in the Paris Agreement, namely that they ensure the environmental integrity and promote sustainable development (cf. UNFCCC, 2016b, Art. 6.1), this could even extend the benefit beyond the committing country, city, or company.

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